MARKING OF HEAT-TREATED SUBSTRATES

The invention relates to a method for marking heat-treated substrates, in particular tempered glass panes, having the characteristics of the preamble of claim 1 and to substrates marked by this method, according to claim 7.

The initial characteristics stem from WO-A1-00/02825, which describes a method for marking glass panes after a heat treatment. According to a preferred application case mentioned in this description, tempered glass panes, that have undergone an aging test following the tempering operation, are provided with a local colored marking. This marking is produced by means of a special thermochromic organic color, that is applied locally, for example by screen printing, after the tempering but before the aging at a predetermined point on the surface of the pane, or alternatively on a thin film covering the latter.

It has been shown that, using the heat soak test, tempered glass panes do not contain critical nickel sulfide inclusions. It is known that such inclusions can lead to sudden spontaneous fracture, with unpredictable consequences, during the life of the tempered glass panes. During the heat soak test, in which the panes are heated to maximum temperatures of generally between 180 and 340°C, especially around 300°C, according to a predetermined time-temperature curve, panes break in a random fashion before they are mounted. The tempering of the panes has still not disappeared at these temperatures. In any case, this heat soak test takes a great deal of time and necessarily incurs relatively high installation costs.

If the thermochromic color has been applied before the test, it undergoes a permanent change by an irreversible conversion of the color. Consequently, it

features of claim 1. The characterizing features of claim 10 present a corresponding substrate. The characterizing features of the secondary claims, or alternatively those subordinate to the independent claims, present advantageous improvements of the subject matters.

To prevent the marking layer, or alternatively the marking color, from being able to be removed by mechanical means, a marking field is produced on one surface of the substrate before the tempering. The substrate is provided with a surface structure that is distinguished from the usual (smooth) surface and causes, in particular, intimate adhesive bonding between the colored field and the marking layer applied to it and, if appropriate, even allows depthwise penetration of the latter.

The marking field may be produced by a local modification of the smooth surface of the substrate itself, by locally modifying the smooth surface so as to achieve particularly good adhesion of the thermochromic marking color, for example by a chemical and/or mechanical action (acid etching, sandblasting, grinding). In this case, small areas of unevenness or small hollows have to appear in the surface of the substrate, these not having a negative impact on the overall printing of the substrate but forming a very good base for depositing the marking, with the result that the latter can be removed only at great cost and almost always still leaving traces thereof.

An alternative approach lies in the deposition of an additional surface structure in the form of a coating to be baked, in particular during the heat tempering. The marking field thus formed also forms a surface that is finely porous or also appropriately structured, to which a marking color, on the one hand, adheres well,

CLAIMS

1. A method for the visual marking of heat-treated substrates, in particular glass panes (1), by modification of a marking layer (8) deposited on a surface of the substrate, that visually indicates that the heat treatment has been carried out, characterized in that a marking field (3) is produced on the surface of the substrate, the surface of the marking field being modified relative to the surface of the substrate in such a way that the marking layer (8) deposited on the latter exhibits intimate adhesive bonding thereto, which marking layer cannot be completely removed using mechanical means.

2. The method as claimed in claim 1, characterized in that a color containing a thermochromic pigment is used as marking layer, the color of which pigment is irreversibly modified at the temperature intended for the heat treatment.

3. The method as claimed in claim 1 or 2, characterized in that a heat-tempered glass pane (1) is used as substrate and in that a heat soak test is carried out for its heat treatment.

4. The method as claimed in any one of the preceding claims, characterized in that the marking field (3) intended for depositing the marking layer (8) is produced by a locally limited chemical and/or mechanical action on the surface of the substrate, during which action hollows appear in this surface into which the marking layer (8) can penetrate.

5. The method as claimed in any one of the preceding claims, characterized in that the marking field (3) intended for depositing the marking layer (8) is produced by depositing a coating (5) with an uneven surface structure.

6. The method as claimed in claim 5, characterized in that the coating (5) is deposited on the surface of the substrate with defined open intermediate spaces (7) into which the marking layer (8) is introduced.

7. The method as claimed in claim 5 or 6, characterized in that the coating (5) is deposited by screen printing and is then baked before the marking layer (8) is deposited, in particular during the heat tempering of a glass pane (1) used as substrate.

8. The method as claimed in any one of the preceding claims, characterized in that the marking field (3) is part of the surface of a marking stamp (2) provided on the surface of the substrate.

9. The method as claimed in any one of the preceding claims, characterized in that the size and the surface structure of the marking field (3) on the one hand and the amount and consistency of the marking layer (8) to be deposited on the marking field (3), on the other hand, are tailored to one another in such a way that, in mass production, the same amount of the material of the marking layer (8) is always deposited in the marking field (3).

10. The method as claimed in one of the preceding claims, characterized in that the heat treatment has a maximum temperature of between 180 and 340°C.

11. Heat-treated substrate, in particular a tempered glass pane (1), with a locally deposited marking layer modified, in a visually perceptible manner, by a heat treatment of the substrate, characterized in that a marking field (3) is produced as base for the marking layer (8) on the surface of the substrate, which marking field has a rough surface structure capable of

forming an intimate bond with the marking layer, which layer cannot be completely removed by simple means.

12. The substrate as claimed in the preceding claim, characterized in that the marking field (3) is produced by hollows formed in the surface of the substrate itself.

13. The substrate as claimed in either of the preceding substrate claims, characterized in that the marking field (3) is applied to the surface of the substrate by screen-printing of a coating (5) in a design or in a grid pattern.

14. The substrate as claimed in the preceding claim, characterized in that the coating (5) is baked and forms part of a manufacturer's mark affixed to the surface of the substrate.

15. The substrate as claimed in one of the preceding claims, characterized in that the coating (5) comprises a grid of intersecting ribs (6) with intermediate spaces reaching as far as the surface of the substrate (1).